CLAIMS

What is claimed is:

1. A circuit for sensing current through a resistive element, the circuit comprising:

a sampling unit switchably coupled to the resistive element, the sampling unit configured to sample a voltage across the resistive element during a sampling mode; and

a charge transfer unit switchably coupling an amplifier to the sampling unit, the charge transfer unit and the amplifier operable to convert the voltage to a ground-referenced output voltage during a charge transfer mode.

2. The circuit of claim 1 wherein the amplifier comprises a bipolar junction transistor-based operational amplifier.

3. The circuit of claim 1 wherein the charge transfer unit comprises first, second, third and fourth switches, the first switch coupling a first terminal of the sampling unit to an input of the amplifier and the second switch coupling a second terminal of the sampling unit to ground during a first charge transfer mode, the third switch coupling the second terminal of the sampling unit to the input of the amplifier and the fourth switch coupling the first terminal of the sampling unit to ground during a second charge transfer mode.

4. The circuit of claim 1 wherein the sampling unit comprises a capacitor.

5. The circuit of claim 1 wherein the resistive element comprises a resistor having a first end

coupled to a battery and a second end coupled to one of a charging unit and a device system.

6. The circuit of claim 1 wherein the resistive element comprises a field effect transistor having a first end coupled to a battery and a second end coupled to one of a charging unit and a device system.

7. The circuit of claim 1 further comprising first and second resistors, the first resistor coupled across a negative-feedback loop of the amplifier, the second resistor coupled between a first end of the first resistor and ground.

8. A circuit for sensing bi-directional current through a resistive element, the circuit comprising:

a sampling unit switchably coupled to the resistive element, the sampling unit configured to sample a voltage across the resistive element during a sampling mode; and

a charge transfer unit switchably coupling a first input of an amplifier to the sampling unit, the first input switchably coupled to a first terminal of the sampling unit when the current flows through the resistive element in a first direction, the first input switchably coupled to a second terminal of the sampling unit when the current flows through the resistive element in a second direction opposite the first direction, the charge transfer unit and the amplifier operable to convert the voltage to a ground-referenced output voltage during a charge transfer mode.

9. The circuit of claim 8 wherein the amplifier comprises a bipolar junction transistor-based

operational amplifier.

10. The circuit of claim 8 wherein the charge transfer unit comprises first, second, third and fourth switches, the first switch coupling the first terminal of the sampling unit to the first input of the amplifier and the second switch coupling the second terminal of the sampling unit to ground when the current flows through the resistive element in the first direction, the third switch coupling the second terminal of the sampling unit to the first input of the amplifier and the fourth switch coupling the first terminal of the sampling unit to ground when the current flows through the resistive element in the second direction.

11. The circuit of claim 8 wherein the sampling unit comprises a capacitor.

12. The circuit of claim 8 wherein the resistive element comprises a resistor having a first end coupled to a battery and a second end coupled to one of a charging unit and a device system.

13. The circuit of claim 8 wherein the resistive element comprises a field effect transistor having a first end coupled to a battery and a second end coupled to one of a charging unit and a device system.

14. The circuit of claim 8 further comprising first and second resistors, the first resistor coupled across a negative-feedback loop of the amplifier, the second resistor coupled between a first end of the first resistor and ground.

15. A method for sensing bi-directional current through a resistive element, the method comprising:

sampling a voltage across the resistive element during a sampling mode;

storing the sampled voltage to a sampling unit during the sampling mode;

connecting a first terminal of the sampling unit to a first input of an amplifier when the current flows through the resistive element in a first direction; and

connecting a second terminal of the sampling unit to the first input of the amplifier when the current flows through the resistive element in a second direction opposite the first direction.

16. The method of claim 15 further comprising generating a ground-referenced voltage at an output of the amplifier corresponding to the current through the resistive element.

17. The method of claim 15 further comprising:

connecting the second terminal to ground when the current flows through the resistive element in the first direction; and

connecting the first terminal to ground when the current flows through the resistive element in the second direction.

18. The method of claim 15 further comprising disconnecting the sampling unit from the resistive element after the sampling mode.

19. The method of claim 15 wherein the amplifier comprises a bipolar junction transistor-

based operational amplifier.

20. The method of claim 15 wherein the sampling unit comprises a capacitor.

21. A mobile communication device comprising:

a transceiver for transmitting and receiving an RF signal;

a mobile power source coupled to the transceiver for supplying power to the transceiver;

a resistive element coupled in series between the mobile communication device and one of the mobile power source and ground;

a sampling unit switchably coupled to the resistive element, the sampling unit configured to sample a voltage across the resistive element during a sampling mode; and

a charge transfer unit switchably coupling an amplifier to the sampling unit, the charge transfer unit and the amplifier operable to convert the voltage to a ground-referenced output voltage during a charge transfer mode.

22. The mobile communication device of claim 21 wherein the amplifier comprises a bipolar junction transistor-based operational amplifier.

23. The mobile communication device of claim 21 wherein the charge transfer unit comprises first, second, third and fourth switches, the first switch coupling a first terminal of the sampling unit to an input of the amplifier and the second switch coupling a second terminal of the sampling unit to ground during a first charge transfer mode, the third switch coupling the second

terminal of the sampling unit to the input of the amplifier and the fourth switch coupling the first terminal of the sampling unit to ground during a second charge transfer mode.

24. The mobile communication device of claim 21 wherein the sampling unit comprises a capacitor.

25. The mobile communication device of claim 21 wherein the resistive element comprises a resistor having a first end coupled to the mobile power source and a second end coupled to one of a charging unit and the mobile communication device.

26. The mobile communication device of claim 21 wherein the resistive element comprises a field effect transistor having a first end coupled to the mobile power source and a second end coupled to one of a charging unit and the mobile communication device.

27. The mobile communication device of claim 21 further comprising first and second resistors, the first resistor coupled across a negative-feedback loop of the amplifier, the second resistor coupled between a first end of the first resistor and ground.